

Remarks

Claims 1 through 7 and 9 through 16 remain pending in the application. Claims 1, 11 and 14 are amended and claim 8 is cancelled.

The specification stands objected to as failing to provide proper antecedent basis for the claimed subject matter, specifically, "computer readable medium." A new paragraph is added by this amendment to clarify that computer readable medium is a physical apparatus for storing or recording data and does not cover non-statutory propagation or transmission mediums. No new matter is added.

A typographical error in paragraph [0070] on page 5 of the application as published is corrected by changing the coefficient " x_1 " to " x_2 ". This correction is supported by equation 15b on page 5.

Claims 1 and 14 are amended to clarify that the digital signal is an audio signal, an image signal or a video signal. Support for this amendment can be found in original claim 8 as well as page 7, lines 2 to 4 of the original specification. Accordingly, claim 8 is cancelled. Claim 1 is further amended to define a method carried out by an audio, image or video processing device. Support for this amendment can be found in the audio encoder 100 of Fig. 1 for carrying out the method of transforming an audio signal, as well as in the image encoder 903 of Fig. 9 for carrying out the method of transforming an image signal.

Claim 11 is amended to correct a word processing error that inadvertently substituted "inverse" for the intended term "integer."

Claims 1 through 8 and 14, 15 and 16 stand rejected under 35 U.S.C. § 101 as non-statutory. Claims 1 and 14 are amended to define the digital signal as an audio signal, an image signal or a video signal. Accordingly, the amended claims are directed to processing for a digital signal representing physical objects, such as sound waves or physical objects captured in an image, in particular, to transform the digital signal representing physical objects to a different state (e.g. to a frequency domain) for further coding purposes. Therefore, the subject matter of amended claims 1 and 14 satisfies prong one of the machine-or-transformation test.

Further, claim 1 is amended to specify a method carried out by an audio, image or video processing device. By this amendment, the method of claim 1 is tied to a particular apparatus. Therefore, the subject matter of amended claim 1 satisfies the second prong of the machine-or-transformation test. Since amended claim 1 satisfies both prongs of the machine-or-transformation test, the rejection of claim 1 and its dependent claims 2-7, 15 and 16 should be withdrawn.

Similarly, claim 14 as amended clarifies that the computer readable medium in claim 14 records a program adapted to make a computer perform a method for transforming a digital signal representing physical objects, as explained above. In addition, according to the explanation of "computer readable medium" in the new paragraph added to the summary of the invention, the computer readable medium is a physical apparatus for storing or

recording data and does not cover a propagation or transmission medium. For these reasons, the rejection with respect to claim 14 should be withdrawn.

Claims 1 through 5, 8, 9, 14, 15 and 16 stand rejected under 35 U.S.C. § 102(b) as anticipated by Geiger, et al., Audio Coding based on Integer Transforms, AES 111th Convention (Sept. 2001). Geiger does not teach or suggest all the limitations of the rejected claims.

Claim 1 defines a method for performing a domain transformation of a digital signal from the time domain into the frequency domain and vice versa. According to the method of claim 1, the transformation is performed by a transformation element comprising a plurality of lifting stages, and the transformation corresponds to a transformation matrix. At least one lifting stage of the plurality of lifting stages comprises at least one auxiliary transformation and a rounding unit, wherein the auxiliary transformation matrix comprises the transformation matrix itself or the corresponding transformation matrix of lower dimension.

Geiger discloses an integer transform method including a plurality of Givens rotations and replacing each Givens rotation with three lifting steps (see sections "DCT-IV by Givens rotations", "the lifting scheme" and "the integer modified discrete cosine transform" on page 4 of Geiger). However, Geiger does not disclose that the auxiliary transformation matrix of the lifting state comprises the transformation matrix itself or the corresponding transformation matrix of lower dimension. For example, as illustrated at the bottom of the left column on page 4 of Geiger, each lifting step comprises a

value related to $\sin \alpha$ or $\cos \alpha$, but does not comprise the transformation matrix of DCT-IV used in Geiger.

In view of the above, Geiger does not disclose the feature that the auxiliary transformation matrix of the lifting state comprises the transformation matrix itself or the corresponding transformation matrix of lower dimension as claimed in claim 1. Therefore, the subject matter of claim 1 and of its dependent claims 2 to 7, 15, 16 is not anticipated by Geiger and this rejection should be withdrawn.

Analogously, the device of independent claim 9 and the computer readable medium of independent claim 14 include the same feature that the auxiliary transformation matrix of the lifting state comprises the transformation matrix itself or the corresponding transformation matrix of lower dimension. Therefore, the subject matter of claims 9 and 14 are not anticipated by Geiger and these rejections should also be withdrawn.

Claims 6, 7, 10, 11 and 13 stand rejected under 35 U.S.C. § 103(a) as not patentable over Geiger.

As discussed above with respect to claim 1, Geiger does not disclose that the auxiliary transformation matrix of the lifting stages comprises the transformation matrix itself or the corresponding transformation matrix of lower dimension. Geiger specifically discloses at the bottom of the left column on page 4 that each lifting step comprises a value related to $\sin \alpha$ or $\cos \alpha$. Geiger does not teach or suggest that the transformation matrix, e.g. the DCT-N transformation matrix on page 4, can be used in the lifting stage. Accordingly, there is no motivation

or suggestion for a person of skill in the art with knowledge of Geiger to understand that the auxiliary transformation matrix of the lifting stage could comprise the transformation matrix or the corresponding transformation matrix of lower dimension as claimed in the present application. This rejection should be withdrawn.

In addition, the transformation method of Geiger decomposes into Givens rotations. This will typically lead to a huge number of Givens rotations, each of which includes three lifting steps. Since each lifting step includes a rounding operation, the total number of rounding operations in the transformation method as taught by Geiger is large and the approximation error caused by the rounding operations will be high. In contrast, the transformation method of the presently amended claims uses the transformation matrix or the corresponding transformation matrix of lower dimension in the auxiliary matrix of the lifting stage, which helps to reduce the required number of lifting stages. Accordingly, the total number of rounding operations and the approximation error caused by the rounding operations are reduced by the transformation method of claim 1.

Since Geiger is only concerned with providing an integer transform method and does not mention any concern to reduce the number of lifting stages or rounding operations, a person skilled in the art, upon reading Geiger, would not be motivated to modify the lifting step of Geiger to arrive at the features of claim 1. Therefore, the subject matter of claim 1 and of its dependent claims 6 and 7 are not obvious in light of Geiger and these rejections should be withdrawn.

Analogously, the device of claims 9 and its dependent claims 10, 11 and 13 have the same integer transform features of claim 1 and thus, are not obvious in light of Geiger. The rejections with respect to claims 10, 11 and 13 should also be withdrawn.

Conclusion

This response has addressed all of the Examiner's grounds for rejection. The rejections based on prior art have been traversed. Reconsideration of the rejections and allowance of the claims is requested.

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